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## A review of the most important medicinal plants effective on wound healing on ethnobotany evidence of Iran

Nahid Jivad<sup>1</sup>, Mahmoud Bahmani<sup>2</sup> and Majid Asadi-Samani<sup>\*3</sup>

<sup>1</sup>Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran

<sup>2</sup>Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

<sup>3</sup>Student Research Committee, Shahrekord University of Medical Sciences, Shahrekord, Iran

### ABSTRACT

Wound is referred to the disruption of joined structure of the body caused by physical, chemical, and biological agents. Wound healing is a reconstructive process which takes place after damage to skin and soft tissues. After damage, inflammatory response is developed and subdermal cells begin to increase the production of collagen and then epithelial tissue is gradually reconstructed. In Iran traditional medicine, natural substances and medicinal plants are used to heal wounds. This study was conducted to review the most important medicinal plants used for wound healing in different provinces of Iran. The key words including wound healing and skin healing combined with the words medicinal plants, ethnobotany, and traditional medicine in Iran were used to search for in the databases Information Sciences Institute, PubMed, Scopus, Islamic World Science Citation Center, and Magiran. The findings of this study on 15 different regions of Iran indicated use of 67 medicinal plants for wound healing. In some regions *Scrophularia striata*, *Althaea officinalis*, *Nerium oleander* L. and *Plantago major* L. were jointly used for wound healing. The medicinal plants reported in this study with their wound-healing property are some alternatives that could be used to develop herbal medicines effective on wound healing if complementary studies confirm their properties.

**Key words:** Medicinal plants, Ethnobotany, Iran, Wound healing

### INTRODUCTION

The body skin is a barrier to invasion of pathogenic microorganisms and loss of water, and prevents bleeding. Therefore, skin is a vital organ whose joined structure may be damaged or disrupted by physical, chemical, and biological agents. This damage is referred to as wound [1, 2]. Wound healing is an active process throughout which a series of connections between different cells, cytokine mediators, and extracellular matrix take place. Generally, wound healing is a continuous process including coagulation, inflammation, proliferation, and recover [3, 4]. Moreover, wound healing is a reconstructive process that takes place after the damage to skin and soft tissue. In fact, after the damage incidence, an inflammatory response is developed and subdermal cells begin to increase collagen and then epithelial tissue is gradually reconstructed [5]. Studies have shown that the factors that contribute to wound healing include fibronectin, macrophage migration inhibition factor, growth factors, matrix metalloproteinases, and hormones [6-10]. In Iran, the disinfectant solutions such as acetic acid and bethadine, washing with physiology serum, hydrocortisones, and antibiotic ointments are used to treat and heal wounds. Several drugs and ointments, with their specific limitations and side effects, are used to heal open wounds [11].

Table 1. The medicinal plants effective on wound healing and complementary data

No.	Scientific name	Family name	Persian name	Plant part used	Effect	Region
1	<i>Fumariavaiillanti</i> Loisel.	Fumariaceae	Shatareh	All organs	Wound healing	Jandagh[60]
2	<i>Heliotropiumramosissimum</i> (Lehm.) DC.	Boraginaceae	Aftabparasteporshakhe	Leaves	Treatment of burns and wounds	Jandagh[60]
3	<i>Plantago major</i> L.	Plantaginaceae	Boz rishi	Leaves and roots	Wound healing	Sardasht[61]
4	<i>Plantagolanceolata</i> L.	Plantaginaceae	Bozrishi	Leaves	Wound healing	Sardasht[61]
5	<i>Albiziajulibrissin</i> Durazz	Fabaceae	Shabkhasab	-	Crushing wound	Babol[62]
6	<i>Achilleamillefolium</i>	Asteraceae	Boumadaran	Leaves and flowers	Wound healing	Bandar Genaveh[63]
7	<i>Sambucusebulus</i>	Caprifoliaceae	Aghti	Leaves and roots	Contusion	Arasbaran [64]
8	<i>Equisetum arvense</i>	Equisetaceae	Dome asb	Shoots	Wound healing	Arasbaran [64]
9	<i>Lamium album</i> L.	Lamiaceae	Gazaneyesefid	Flowering shoot	Wound healing	Arasbaran [64]
10	<i>Origanum vulgare</i>	Lamiaceae	Marzanjoush	Flowering shoot	Wound healing	Arasbaran [64]
11	<i>Rumexacetosa</i>	Polygonaceae	Torshak	Leaves	Skin lesions	Arasbaran [64]
12	<i>Verbascumplumoides</i>	Scrophulariaceae	Golemahour	Flowers	Wound healing	Arasbaran [64]
13	<i>Saniculaeuropaea</i>	Apiaceae	Marhami	Shoots	Wound healing	Arasbaran [64]
14	<i>Cercissiliquastrum</i>	Caesalpiniaceae	Arghavan	Leaves and stem	Infectious wound restoration	Sirjan [65]
15	<i>Citrulluscolocynthis</i>	Cucurbitaceae	Hendavaneaboujahl	Fruits	Wound healing	Sirjan [65]
16	<i>Datura stramonium</i>	Solanaceae	Tatoureh	Leaves and seeds	Burn wound restoration	Sirjan [65]
17	<i>Glycyrrhizaglabra</i>	Fabaceae	Shirinbian	Rhizome	Contusion	Sirjan [65]
18	<i>Malvamicrocarpa</i>	Malvaceae	Panirak	Leaves and seeds	Infectious wound restoration	Sirjan [65]
19	<i>Plantagoamplexicaulis</i>	Plantaginaceae	Barhangesagheaghoush	Seeds	Wound healing	Sirjan [65]
20	<i>Plantagolanceolata</i>	Plantaginaceae	Barhangeneizei	Leaves and seeds	Wound healing	Sirjan [65]
21	<i>Scrophulariascopoli</i>	Scrophulariaceae	Golemeymounighafghazi	Fruits	Wound healing	Sirjan [65]
22	<i>Salvia compressa</i>	Lamiaceae	Maryam goligarmsiri	Shoots	Infectious wound restoration	Sirjan [65]
23	<i>Calotropisprocera</i> (Aiton) W.T. Aiton	Asclepiadaceae	Estarbagh	Leaves	Infectious wound restoration	Persian Gulf [66]
24	<i>Cressacretical</i> L.	Convolvulaceae	Alafemouche	Shoots	Infectious wound restoration	Persian Gulf [66]
25	<i>Ricinus communis</i>	Euphorbiaceae	Karchak	Seeds	Burn and infectious wound restoration	Persian Gulf [66]
26	<i>Prosopisfarcta</i>	Fabaceae	Kahour	Seeds	Wound healing	Persian Gulf [66]
27	<i>Ziziphus spina-christi</i> (L.) Willd.	Rhamnaceae	Konar	Leaves	Wound healing	Persian Gulf [66]
28	<i>Beta vulgaris</i> L.	Amaranthaceae	Ghoghondar	Leaves	Wound healing	Khuzistan[67]
29	<i>Neriumindicum</i> Mill.	Apocynaceae	Kharzahre	Leaves	Wound healing	Khuzistan[67]
30	<i>Carthamustinetorius</i> L.	Asteraceae	Golrang	Flowers	Wound healing	Khuzistan[67]
31	<i>Echinopsperciscus</i>	Asteraceae	Shekartighal	flower and seed	Wound healing	Khuzistan[67]
32	<i>Helianthus annus</i> L.	Asteraceae	Aftabgardan	Stem and seeds	Wound healing	Khuzistan[67]
33	<i>Teucriumpolium</i> L.	Lamiaceae	Maryam nokhodi	Shoots	Infectious wound restoration	Khuzistan[67]
34	<i>Olea europaea</i> L.	Oleaceae	Zeytoun	Leaves and fruit	Burn wound restoration	Khuzistan[67]
35	<i>Astragalusadscondens</i> Boiss. &Hausskn.	Fabaceae	Gazkhansar	-	Burn wound restoration	Khuzistan[67]
36	<i>Alhagipersarium</i> Boiss. &Buhse.	Fabaceae	Kharshotor	Leaves and flower	Wound healing	Sistan[68]
37	<i>Aloe vera</i> L.	Asphodeloideae	Sabre zard	Leaves	Wound healing	Sistan[68]
38	<i>Medicago sativa</i> L.	Fabaceae	Younjeh	Leaves and stem	Wound healing	Sistan[68]
39	<i>Plantagolanceolata</i> L.	Plantaginaceae	barhang	Leaves and seeds	Wound healing	Sistan[68]
40	<i>Portulacaoleracea</i> L.	Portulacaceae	Khorfeh	Leaves	Burn wound restoration	Sistan[68]
41	<i>Seneciogallicus</i> Chaix.	Asteraceae	-	-	Chronic wound healing	Kazeroon[69]
42	<i>Fraxinusangustifolia</i>	Oleaceae	Zabangonjeshk	-	Burn healing	Kazeroon [69]
43	<i>Bromus tectorum</i> L.	Poaceae	Alafepashmaki	-	Wound healing	Kazeroon [69]
44	<i>Polygonumpatalum</i> M.B.	Polygonaceae	Haft band	-	Burn healing	Kazeroon [69]
45	<i>Allium sativum</i> L.	Alliaceae	Sir	Bulb	Wound healing	Mobarakeh [70]
46	<i>Calendula persica</i> C. A. Mey.	Asteraceae	Golehamishebahr	Flowers	Wound healing	Mobarakeh [70]
47	<i>Menthapulegium</i> L.	Lamiaceae	Pouneh	Leaves	Wound healing	Mobarakeh [70]
48	<i>Myrtuscommunis</i> L.	Myrtaceae	Mourd	Root	Wound healing	Mobarakeh [70]
49	<i>Pistaciaatlantica</i> Desf. subsp. <i>Kurdica</i> (Zohary) Rech. f	Anacardiaceae	Bane kordestani	Stem and fruit	Surface wound healing	Marivan[71]
50	<i>Quercusbrantii</i> Lindl	Fagaceae	Baloutirani	Leaves and fruit	Burn restoration	Marivan[71]
51	<i>Ranunculus sericeus</i> Willd.	Ranunculaceae	Alaleh	Leaves and rhizome	Wound healing	Marivan[71]
52	<i>Centaureagauhae</i> (Bornm.) Wagenitz.	Asteraceae	Golegandombiabani	Leaves	Wound healing	Natanz[72]
53	<i>Althaea officinalis</i>	Malvaceae	Khatmi	Flowers and seeds	Wound healing	Lorestan[73]
54	<i>Daphne mucronata</i>	Thymelaeaceae	Mezarion	Leaves	Wound healing	Lorestan[73]
55	<i>Lens culinaris</i>	Fabaceae	Adasegermez	Fruits	Wound healing	Lorestan[73]
56	<i>Narcissus papyraceus</i>	Amaryllidaceae	Narges	Root	Wound healing	Lorestan[73]
57	<i>Peganumharmala</i>	Zygophyllaceae	Espand	Seeds	Wound healing	Lorestan[73]
58	<i>Scrophulariastrata</i>	Scrophulariaceae	Golemeymouni	Shoots	Wound healing	Lorestan[73]
59	<i>Alceaangulata</i> (Frey & Sint) Freyn & Sint. Ex Iljin	Malvaceae	Golekhatmi-goshedar	Root	Cut restoration	Ilam[74]
60	<i>Aristolochiaolivieri</i>	Aristolochiaceae	zaravand	Leaves and stem	Wound healing	Ilam[74]
61	<i>Nerium oleander</i> L.	Apocynaceae	Kharzahre	Leaves and flowers	Cut restoration	Ilam[74]
62	<i>Scrophulariadeserti</i> Del.	Scrophulariaceae	Golemeymouni-biabani	Leaves and stem	Cut and burn restoration	Ilam[74]
63	<i>Scrophulariastrata</i> Boiss.	Scrophulariaceae	Golemeymouni-sazouei	Leaves and stem	Cut and burn restoration	Ilam[74]
64	<i>Sesamumindicum</i> L.	Pedaliaceae	Konjed	Seeds	Cut restoration	Ilam[74]
65	<i>Solanum nigrum</i> L.	Solanaceae	Tajrizi	Fruits	Cut restoration	Ilam[74]
66	<i>Tamarixramosissima</i> Ledeb. saltcedar	Tamaricaceae	Shorgaz	Leaves and resin	Cut restoration	Ilam[74]
67	<i>Verbascumalepense</i> Benth.	Scrophulariaceae	Golezardeh	Leaves and flowers	Wound healing	Ilam[74]

In Iran traditional medicine, natural substances and medicinal plants are also used for wound healing [12-14]. Although use of chemical and synthetic drugs has been extremely become popular over the past half-century [15-23], their deleterious effects on human life has caused reconversion to medicinal plants, and several studies have been conducted to investigate and confirm their effects on different diseases and to determine their effective dose [24-36]. In fact, serious tendency to using medicinal plants has been instigated for several reasons including their fewer side effects of different types and effective substances, the recommendations of medicinal plants cultivation-related industries, prevention of currency outflow, helpful entrepreneurship, and World Health Organization's recommendations to use medicinal plants [37-48]. This tendency towards medicinal plants has caused natural drugs to be considered as the basis of and even only treatment, and their compounds to be used in pharmaceutical industry [49-59].

Since medicinal plants are used for wound healing in Iran traditional medicine and the people of any region have its specific drug culture and empirically use its own flora, this review article seeks to identify the medicinal plants used

for wound healing in different provinces of Iran. In this line, the medicinal plants that are used for wound healing in ethnobotanical resources of Iran are reported.

In this review article, the key words including wound healing and skin healing combined with medicinal plants, ethnobotany, and traditional medicine in Iran were used to search for the relevant articles in the databases Information Sciences Institute, PubMed, Scopus, Islamic World Science Citation Center, and Magiran and the relevant articles were selected. The articles with no abstract in English language or no accessible full text were excluded.

The findings of this study indicated that in different regions of Iran such as Khandagh, West Azarbaijan, Babol, Bandar Genaveh, Arasbaran, Kerman, Persian Gulf, Khuzestan, Sistan, Kazeroun, Mobarakeh of Isfahan, Marivan, Natanz of Kashan, Lorestan, and Ilam, overall 67 medicinal plants were used for wound healing. The findings of this study indicated that in some regions *Scrophularia striata*, *Althaea officinalis*, *Nerium oleander* L. and *Plantago major* L. were jointly used for wound healing while many of the species of plants are various and different.

## DISCUSSION

The findings of this study to review the most important medicinal plants effective on healing of skin wounds based on ethnobotany evidence of Iran, indicated that overall 67 medicinal plants are used for wound healing in different regions of Iran. Most of the plants were from five families: Fabaceae, Asteraceae, Scrophulariaceae, and Plantaginaceae.

Studies have shown that in the extract of some plants, there are bioactive substances with antiseptic and anti-inflammatory properties and hence are able to heal wounds, as well [75, 76]. The plants in the present study are used for wound healing because of the effective and antioxidant substances. Flavonoids which are present in many of the plant families, particularly Asteraceae are involved in wound healing and are free radicals-removing due to the inhibition of nitric oxide synthesis [77]. Further, polysaccharides existing in most species of the plants presented in this study exert significant anti-inflammatory and immunomodulatory effects and are effective on burns, wounds, internal inflammations, irritations, and diarrhea [78]. It is recommended to study the cited plants phytochemically so as to identify the compounds mainly and jointly present in the family plants, Fabaceae, Asteraceae, Scrophulariaceae, and Plantaginaceae, and to study them for their wound-healing properties in animals and humans, so that they may be used to produce the herbal medicines for wound healing if their therapeutic effect is confirmed.

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